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ISO TC 184/SC4 Reference Manual

Joan Wellington
Bradford Smith

U.S. DEPARTMENT OF COMMERCE
Technology Administration
National Institute of Standards
and Technology
Manufacturing Engineering Laboratory
Manufacturing Systems Integration Division
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June 1995

U.S. DEPARTMENT OF COMMERCE
Ronald H. Brown, Secretary

TECHNOLOGY ADMINISTRATION
Mary L. Good, Under Secretary for Technology

NATIONAL INSTITUTE OF STANDARDS
AND TECHNOLOGY
Arati Prabhakar, Director

June 25, 1995

To: All SC4 Participants and Observers

From: Bradford Smith, SC4 Chairman

Subject: June 1995 Reference Manual

Attached is a newly updated copy of our subcommittee's Reference Manual. This document has been published twice a year for the last several years in an effort to introduce new experts to the work of our committee and to serve as a single reference source for those actively involved with SC4 standards development. It contains:

- descriptions of our organizational structure and approval procedures,
- listings of our technical personnel and projects under development,
- details of our many forms of electronic archives and communications mechanisms.

Every effort has been made to be certain that the information presented is accurate and up-to-date. However, there are numerous external pressures that are causing increasingly frequent changes in the document - new ISO Directives coming out this year, an ongoing reorganization of some SC4 elements, and the inevitable changes in some of our leadership positions.

With respect to the first two elements, I expect that a new SC4 Organizational Handbook will be published by October. This will detail how the new ISO procedures for concensus approval of standards will be implemented within SC4. It will also define the last remaining elements of our committee reorganization which began at the May 1994 meeting in Davos. Several elements of the reorganization are already in place and functioning; a new Working Group 10 on Architecture and the Policy and Planning Committee.

With the publication of the Organizational Handbook, there will no longer be a need for publication of this Reference Manual in its current form. Hence, I expect this will be the last edition published. The lists of projects, personnel and approval status are much easier to keep current electronically on-line rather than in paper form such as this.

Any questions about the content of this manual or access to SC4 project information can be addressed to our committee Secretariat:

Ellen Trager
NIST Bldg 220 Room A127
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Lastly, I wish to thank Joan Wellington for her careful work in organizing the material in this Reference Manual and for keeping it updated in each draft edition.

ISO TC 184/SC4
Reference Manual

Contents

ISO TC 184/SC4
REFERENCE MANUAL

Introduction

This reference manual contains background information on the International Organization for Standardization (ISO) and its Technical Committee 184. It gives a detailed explanation of the technical work of TC 184's Subcommittee 4 (TC 184/SC4) and information on the working groups and advisory committees that carry out that technical work.

The International Organization for Standardization

In October 1946, 65 delegates representing 25 countries met in London to consider the establishment of a new international organization "whose object shall be to facilitate the international coordination and unification of industrial standards." These delegates' discussions led to the establishment of the International Organization for Standardization (ISO) whose provisional General Assembly met in London October 24, 1946.

The proposed ISO Constitution and Rules for Procedure were unanimously adopted by that General Assembly. In other business, the General Assembly decided that ISO should begin to function on an official basis as soon as 15 national bodies had ratified the constitution. The provisional Central Secretariat received the 15th ratification from Denmark February 23, 1947. The first General Assembly met in Paris in 1949.

ISO Objective

The objective of ISO is to promote the development of standards in the world with a view to facilitating the international exchange of goods and services and developing cooperation in the sphere of intellectual, scientific, technological, and economic activity.

To do this, ISO may:

- Take action to facilitate coordination and unification of national standards and issue necessary recommendations to national bodies for this purpose;
- Set International Standards;
- Encourage and facilitate, when necessary, the development of new standards having common requirements for use in the national or international sphere;

- Arrange for exchange of information regarding work of its Member Bodies and technical committees;

- Cooperate with other international organizations interested in related matters, particularly by undertaking, at their request, studies related to standardization projects.

Membership

ISO membership is composed of national bodies, each of which represents the primary standards organization of its respective country. Therefore, only one such organization in each country may be admitted to membership in the ISO. Each national body has the right to membership on any technical committee or subcommittee and can choose to be a participating member (P-member) or observing member (O-member). A P-member is expected to participate actively in the work of the technical committee with an obligation to vote on all questions formally submitted for voting and whenever possible, participate in meetings. An O-member follows the work as an observer, receives committee documents, and has the right but not the obligation to submit comments and attend meetings.

Organization

The principal officers of ISO are the President, the Vice President, the Treasurer, and the Secretary-General. The Secretary-General (the Chief Executive Officer of the organization) directs the work of the Central Secretariat that coordinates the work of the ISO technical committees, convenes all meeting of technical committees and subcommittees, institutes the voting procedures, circulates documents to national bodies, and publishes documents approved as International Standards.

The scope of the technical committees is strictly defined. Within this scope, each technical committee determines its own program of work.

In December 1983, the International Organization for Standardization initiated Technical Committee 184 on Industrial Automation and Integration. Subcommittee 4 was formed at that time to work in the area of representation and exchange of digital product data.

Technical Committee 184/Subcommittee 4

The work of Technical Committee 184's Subcommittee 4 (TC 184/SC4) is the development of International Standards dealing with the use of digital product and manufacturing management data.

Title: Industrial Data

Scope: Standardization of information that is shared or exchanged in the area of industrial and manufacturing applications. Three areas of scope have been approved for SC4:

Product data,
Industrial manufacturing management data, and
Global manufacturing programming languages.

Chairman: Bradford M. Smith

Membership: Approximately 400 experts from 28 countries are involved with the work of SC4. Seventeen of these countries are classified as P-members and eleven as O-members.

Technical committees working in related fields establish and maintain liaisons. There are two categories of liaison. Category A comprises organizations that make an effective contribution to the work of the technical committee. Category B comprises organizations that have indicated a wish to be kept informed of the work of the technical committee or subcommittee.

Lists of the SC4's P-members, O-members, and liaisons follow.

P-Members	O-Members	Liaisons
Australia	Bulgaria	AECMA (a)
Belgium	China	CAM-I (b)
Brazil	Denmark	JTC1/SC21/WG3 (a)
Canada	Czech Republic	JTC1/SC24 (a)
France	Finland	NAFIMS (a)
Germany	Hong Kong	PDES, Inc. (a)
Hungary	Poland	ProSTEP (a)
Italy	Portugal	ISO TC10 (a)
Japan	Singapore	ISO TC172/SC1 (a)
Netherlands	South Korea	ISO TC184/SC5 (a)
Norway	Spain	IEC TC3 (a)
Romania		IEC TC93 (a)
Russia		US PRO (a)
Sweden		
Switzerland		
United Kingdom		
United States		

Work Items: Within each area of SC4's scope there are formal work items that have been approved under the ISO NWI (new work item) procedure. The following work items have been formally approved by SC4:

1. Digital product data,
2. Parts library,
3. Industrial manufacturing management data,
4. Data access interface,
5. Product software,
6. Parametrics,
7. Building structural steelwork,
8. Building services, heating, ventilation and air conditioning
9. Building construction core model,
10. Amendment 1 to ISO 10303-1, and
11. STEP development methods.

Projects: A project is any work intending to lead to the issue of a new, amended or revised International Standard or work resulting in the publication of an SC4 Technical Report.

A total of 80 projects are now being actively worked on by SC4. Five projects were canceled in 1994 for lack of resources needed to continue work. Each SC4 project is managed by a project leader; some of whom have found the need for a deputy project leader. Most have assigned a document (or part) editor. The list of project titles and leaders begins on page 16.

Meetings Held: TC 184/SC4 has met 14 times since the Subcommittee was formed in 1984. The June 1995 meeting of its Working Groups (WGs) is their 38th since the formation of WG1. The list of meetings follows.

July	'84	SC4	Washington, DC, USA
November	'84	WG1	Frankfurt, Germany
March	'85	WG1	Paris, France
March	'85	SC4	Paris, France
July	'85	WG1	Madison, WI, USA
December	'85	WG1	Leeds, England
March	'86	WG1	Zurich, Switzerland
July	'86	WG1	Seattle, WA, USA
November	'86	WG1	Frankfurt, Germany
March	'87	WG1	West Palm Beach, FL, USA
June	'88	WG1	London, England
October	'88	WG1	St Louis, MO, USA
January	'88	SC4	Rotterdam, Netherlands

January	'88	WG1	Rotterdam, Netherlands
July	'88	WG1	Denver, CO, USA
November	'88	SC4	Tokyo, Japan
November	'88	WG1	Tokyo, Japan
April	'89	WG1	San Antonio, TX, USA
June	'89	WG1	Frankfurt, Germany
October	'89	WG1	Albuquerque, NM, USA
January	'90	WG1	Paris, France
January	'90	SC4	Paris, France
April	'90	WG1	Reston, VA, USA
June	'90	WG1	Gothenburg, Sweden
June	'90	SC4	Gothenburg, Sweden
October	'90	WGs	St Louis, MO, USA
February	'91	WGs	Eindhoven, Netherlands
April	'91	WGs	San Diego, CA, USA
July	'91	WGs	Sapporo, Japan
July	'91	SC4	Sapporo, Japan
July	'91	WG7	Chilton Oxon, UK
October	'91	WGs	Houston, TX, USA
February	'92	WGs	Oslo, Norway
February	'92	SC4	Oslo, Norway
April	'92	WGs	Seattle, WA, USA
June	'92	WGs	London, UK
October	'92	WG6	Paris, France
October	'92	SC4	Dallas, TX, USA
October	'92	WGs	Dallas, TX, USA
February	'93	SC4	Turin, Italy
February	'93	WGs	Turin, Italy
June	'93	WGs	Atlanta, GA, USA
October	'93	WGs	Berlin, Germany
October	'93	SC4	Berlin, Germany
January	'94	WGs	Phoenix, AZ, USA
May	'94	SC4	Davos, Switzerland
May	'94	WGs	Davos, Switzerland
October	'94	SC4	Greenville, SC, USA
October	'94	WGs	Greenville, SC, USA
March	'95	SC4	Sydney, Australia
March	'95	WGs	Sydney, Australia
June	'95	WGs	Washington, DC, USA

The Organization of SC4

The work of SC4 was originally accomplished by one WG (WG1) that included all projects. In response to a request from TC 184 and to comply with new ISO/IEC (International Electrotechnical Commission) rules, SC4 reorganized its work into six WGs. To indicate that the work had been reorganized, WG1 was not used in the numbering of the new WGs. Since that time, three additional WGs have been added. The work of SC4 is currently organized into nine WGs and three advisory groups.

The nine Working Groups are:

Working Group 2	Parts Library
Working Group 3	Product Modeling
Working Group 4	Qualification and Integration
Working Group 5	STEP Development Methods
Working Group 6	Conformance Testing Procedures
Working Group 7	Implementation Specifications
Working Group 8	Industrial Manufacturing Management Data
Joint Working Group 9	Electrical/Electronics Applications
Working Group 10	Architecture

The technical work of each WG is subdivided into logical tasks each directed by a project leader. Each WG is led by a convener who may serve as a project leader but is additionally responsible for coordinating the other project leaders.

ISO/IEC Directives Part 1- *Procedures for the technical work*, Third edition, 1995, outlines procedures for carrying out the technical work. Subclauses 1.10 and 2.4 of that document give information on the responsibilities of a Working Group. SC4 has established additional procedures for planning the technical work, conducting meetings, and disseminating results that make these responsibilities more explicit. There is an advisory group for each of these three areas.

The three advisory groups are:

Policy and Planning Committee,
Project Management Advisory Group, and
SC4 Editing Committee.

Subclause 1.11 of the ISO/IEC Directives referenced above gives the responsibilities of an advisory group.

The SC4 Working Groups

Working Group 2

Title: Parts Library (P-LIB)

Scope: The scope of work of WG2 is to design a set of standards that specify how a library supplier shall describe the library in a way that this library might be integrated automatically (compiled) into any User Part Library.

The first version of the WG2 standard will possibly restrict its scope to the exchange of part family description and identification (called general models), and part geometrical representation description (called geometry functional models).

All kinds of libraries have to be based on the same generic library model. To avoid duplication of work inside SC4, it is important that all work about library structures be done within WG2.

Convener: Gerd Ehinger
Deputy: Guy Pierra

Working Group 3

Title: Product Modeling

Scope: The scope of work of WG3 is to develop the parts of ISO 10303 that are members of the integrated resources and application protocol (AP) series.[1] To carry out its work, WG3 is divided into teams each of which has one or more projects.

WG3 teams are responsible for:

1. Developing all product models within their scopes.
2. Developing the APs required to implement the product models.
3. Working with owners of APs and models as these are carried through qualification, integration, editing, balloting, and approval as International Standards.
4. Identifying new work items in response to industry needs.

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[1] For an explanation of the series of parts of ISO 10303 refer to The STEP Project write-up that begins on page 13.

Project teams must closely interface with external AP development activities to ensure that:

1. The product models support the AP requirements.
2. The APs are not redundant with existing internal or other external APs.
3. The APs make correct use of the underlying product model data.

Convener: Barbara Warthen
Deputy: Joachim Rix

Teams:
- T1 Shape Representation
- T2 Presentation
- T3 (Tolerances merged into T7)
- T4 Materials
- T5 (Form Features merged into T7)
- T6 Draughting
- T7 Mechanical Product Definition
- T8 Product Structure and Life Cycle Support
- T9 Finite Element Analysis
- T10 (Electrical/Electronics moved to JWG9)
- T11 Manufacturing Technology
- T12 Architecture, Engineering, & Construction
- T13 Kinematics
- T14 Technical Publications
- T15 (Product Structure merged into T8)
- T16 Software Products
- T17 Product Functionality
- T18 Sheet Metal
- T19 Automotive

Working Group 4

Title: Qualification & Integration

Scope: The scope of work of WG4 is to qualify and integrate the parts of ISO 10303 that are members of the integrated resources and application protocol series. This work is divided among five projects.

Convener: Yuhwei Yang
Deputy: Allison Barnard Feeney

Projects:
- P1 Qualification & Validation
- P2 Resource Integration
- P3 AIM Development
- P4 Currently unassigned
- P5 AP Framework & Guidelines
- P6 AP Integration

Working Group 5

Title: STEP Development Methods

Scope: The current scope of work of WG5 is to develop the languages used in parts of ISO 10303.

Convener: Vacant
Deputy: Vacant

Projects:
- P1 Methods (recently assigned to WG10)
- P2 Languages

Working Group 6

Title: Conformance Testing Procedures

Scope: The scope of work of WG6 is to develop standards that cover the methodology for conformance testing. Such standards may be applied to all APs using standardized implementation methods. The standards include an overview of conformance testing, the requirements placed on the testing laboratory and its clients, abstract test suites, and abstract testing methodologies. WG6 also provides guidance to AP developers in the writing of their conformance requirements and abstract test suites.

Convener: Sheila Lewis
Deputy: Tom Phelps

Working Group 7

Title: Implementation Specifications

Scope: The scope of work of WG7 is to develop those parts of ISO 10303 that are members of the implementation methods series and to serve as a resource for information on implementations of these parts.

Convener: Jan van Maanen
Deputy: Martin Hardwick

Projects:
- P1 Exchange structure
- P2 Data access specification

Working Group 8

Title: Industrial Manufacturing Management Data

Scope: The scope of work of WG8 is to develop the methods and the standardized data that will express information exchanged inside industrial manufacturing plants, except for product definition data.

Convener: Albert Colin
Deputy: Paul Clements

Projects:
- P1 External communications
- P2 Resource usage
- P3 Flow control - Data to control and monitor flow of material

Joint Working Group 9

Title: Joint Working Group for Electrical and Electronic Applications of ISO 10303

Scope: The scope of JWG9 is to develop resource models and application protocols using STEP methodologies taking into account documented efforts such as EDIF (Electronic Design Interchange Format), IGES (Initial Graphics Exchange Specification), and SET (Standard d'exchange et transfert). This group will work jointly with IEC TC3 among others.

Convener: Vacant
Deputy: Reinhard Nerke

Working Group 10

Title: Architecture

Scope: The scope of WG10 is to resolve the technical direction and related technical issues of SC4 so that the results are consistent with the SC4 vision and acceptable to SC4 as a whole. The objective is to define and maintain a consistent set of architectures for the standards within SC4.[2]

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[2] This wording is taken from SC4 Resolution 217 (Greenville #7, October 1994) that established this Working Group.

Convener: Julian Fowler
Deputy: Bernd Wenzel

SC4 Advisory Groups

Policy and Planning Committee (PPC)

Scope: The scope of the PPC is to assist the SC4 Chairman, conveners, and project leaders with the following tasks:

1. Facilitating the smooth running of the organization.
2. Monitoring the effectiveness of the organization.
3. Promoting the work and results of SC4.
4. Strategic and tactical planning, including resource planning.[3]

Convener: Will be chosen by the committee from among its members.

Membership: The PPC shall consist of six members who have management experience. Candidates for the PPC are nominated by the P-member countries. The SC4 Chairman shall select an ad hoc committee of four to six persons from the nations most involved in the WGs. This committee shall propose the membership of the PPC from the list of candidates. They shall be approved at an SC4 meeting or by mail ballot.[3]

Project Management Advisory Group (PMAG)

Scope: The scope of work of the PMAG is the project management of all STEP development activities within SC4.[4]

To carry out its scope, PMAG:

1. Documents and supports general understanding of STEP requirements, functional goals, and priorities.

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[3] This information is taken from the November 2, 1994, version of the SC4 Organisation Group's Organisation Handbook.

[4] Once the PPC Organisation Handbook has been approved, the PMAG will go out of existence. The PPC will carry on its duties.

2. Establishes and maintains a STEP project plan including work breakdown structure, deliverables, schedules, resources, and dependencies between tasks.
3. Establishes and monitors criteria and procedures for quality deliverables.
4. Coordinates activities at joint Working Group meetings.

Working with WG conveners, PMAG is responsible for defining the scope and general content of each part, having a clearly defined and well integrated set of part scopes, and laying the groundwork for consensus and approval of the documents as standards.

Membership: One voting member and one alternate are nominated by each P-member. Nine countries currently have nominated members.

Meetings: Scheduled and ad hoc meetings at joint Working Group meetings are generally open to all STEP leaders.

Convener: Neal Laurance
Deputy: Howard Mason

SC4 Editing Committee

Scope: The scope of work of the SC4 Editing Committee is to assist in the preparation of texts, consistent among themselves and with the ISO Directives and to provide review for technical coherence across texts.

Membership: The membership of the Editing Committee comprises a chairman, deputy chairman and all project leaders or their representatives responsible for text preparation. Each SC4 P member may nominate additional members. To achieve committee objectives, other members may be co-opted by the chairman.

Chairman: Nigel Shaw
Deputy: Vacant

The Projects of SC4

The work of SC4 is divided into three major projects--the STEP Project, the Parts Library Project, and the Manufacturing Management Data Project. Information on each project follows.

The STEP Project

SC4's STEP (Standard for the Exchange of Product Model Data) Project is developing International Standard ISO 10303 to fill industry's need for a comprehensive solution for sharing product information in computer-sensible form. STEP addresses the complete life cycle of a product and specifies how all information can be represented in a neutral form. The project focuses on the sharing and exchange of product model information without loss of completeness or data integrity.

The product model is expected to be informationally complete for purposes such as generating manufacturing process instructions, directing quality control testing, and performing product support functions.

In addition to shape representation, the standard can support a wide range of non-geometry data such as tolerance specifications, material properties, and surface finish specifications. The geometry model includes solid representations for both boundary and constructive solid geometry forms. The standard is known informally as STEP and officially as *ISO 10303 - Industrial automation systems and integration - Product data representation and exchange.* The following quote from the introduction to the standard gives a short explanation of STEP.

> "ISO 10303 is an International Standard for the computer-sensible representation and exchange of product data. The objective is to provide a mechanism capable of describing product data throughout the life cycle of a product, independent of any particular system. The nature of this description makes it suitable not only for file exchange, but also as a basis for implementing and sharing product databases and archiving.
>
> "ISO 10303 is organized as a series of parts, each published separately. The parts fall into one of the following series: description methods, integrated resources, application protocols, abstract test suites, application interpreted constructs, implementation methods, and conformance testing methodology and framework."

Application protocols convert end-user requirements into specifications of information requirements for data exchange. The APs define the scope (using an activity model), the information to be exchanged (using an information model), a uniform representation for the

information (using another information model) while a set of test methods define the means by which implementations of APs are tested for conformance.

To ensure a uniform representation across life-cycle applications, STEP APs re-use information from the parts in the integrated resources series. These parts specify data structures and data semantics that are general enough to support multiple engineering disciplines. Parts in the implementation methods series define the communication interface and a description method or language is used to specify and constrain the data structures and data semantics.

To focus STEP development work on an initial core capability that demonstrates all of the required technical concepts, SC4 defined an Initial Release of twelve parts. They are ISO 10303 parts 1, 11, 21, 31, 41-44, 46, 101, 201, and 203. Through these parts, the Initial Release supports two application protocols, draughting and configuration controlled design. Physical file exchange and conformance testing are also included. (See Appendix A for the scopes of parts of ISO 10303 that comprise the Initial Release.)

All twelve parts of the Initial Release were approved as International Standards and released by ISO on December 15, 1994. Copies are now available from national bodies.

The continued goal of ISO 10303 is to support the creation of complete representations of products through the entire manufacturing process and not merely graphical representations, existing standards for which are already established (for example: Graphical Kernel System (ISO 7942) and Computer Graphics Metafile (ISO 8632).

In addition to the standard itself, companion documents are being developed to support implementation, testing, and engineering.

The Parts Library Project

The second major area of standards development within SC4 is Parts Library (P-LIB). Its goal is to specify a capability for sharing parts library information. Libraries of information are critical to many applications in design and engineering where the end product includes the assembly of components procured from multiple sources. Examples of this can be seen in plant design, large mechanical assemblies and many electrical or electronic applications.

This standard will offer the capability for computer-sensible representation and exchange of parts library data. The objective is to provide a mechanism for transferring parts library data that is independent from any particular system. The nature of this description makes it suitable not only for the exchange of files containing standard parts, but also as a basis for implementing and sharing databases of parts library data, and archiving.

P-LIB provides a representation of part library information along with the necessary mechanisms and definitions to enable part library data to be exchanged, used, archived and

updated. The exchange is anticipated among different computer systems and environments associated with the complete life cycle of the products where the library parts may be used, including product design, manufacture, utilization, maintenance, and disposal.

ISO has assigned the number ISO 13584 to the documents to be published by the Parts Library Working Group (WG2). This standard, like ISO 10303, is being documented in a series of parts that together comprise the technology for representing and sharing library information.

The following nine documents are under development by Working Group 2:

Part Number	Title
13584-1	Overview and fundamental principles
13584-10	Conceptual model of parts library
13584-20	General resources
13584-24	Logical model of supplier library
13584-26	Identification of library suppliers
13584-31	Programming interface
13584-42	Dictionary methodology
13584-101	Geometrical view exchange protocol by parametric program
13584-102	Geometrical view exchange protocol by ISO 10303 conforming model specification

Parts 1, 10, 26, 31, and 42 will complete their Committee Draft balloting in July 1995.

The Manufacturing Management Data Project

The third major area of work within SC4 is the development of a series of International Standards for the data (other than product data) that are shared within an industrial manufacturing plant or that are exchanged among different manufacturing plants. Three project areas are being actively worked on within the Manufacturing Management Data (MANDATE) project.

The scope of Project 1 is to develop a standard for the data that are exchanged between an industrial manufacturing company and its environment of manufacturing management activities.

The scope of Project 2 is to develop a standard for the data that describe an industrial manufacturing company's resources database.

The scope of Project 3 is to develop standard for the data that control and monitor the flow of materials within an industrial manufacturing company.

Current Projects, Project Leaders and Document Editors

ISO Part Number	*Current Projects and Project Personnel*

Note: Unless there is a follow-on project underway (as in ISO 10303-1), the projects that produced the Initial Release of ISO 10303 have been omitted since their work is complete.

10303-1 Amendment 1 for Part 1: Overview and fundamental principles
- Project Leader: Howard Mason
- Part Editor: Nigel Shaw

10303-11 Description methods: The EXPRESS language reference manual: Edition 2
- Project Leader: Phil Spiby
- Part Editor: Phil Spiby

10303-12 Description methods: EXPRESS-I language reference manual
- Project Leader: Phil Spiby
- Part Editor: Peter Wilson

10303-13 Description methods: STEP development methodology
- Project Leader: Julian Fowler
- Part Editor: Vacant

10303-22 Implementation methods: Standard data access interface (SDAI)
- Project Leader: Jan van Maanen
- Part Editor: David Price

10303-23 Implementation methods: C++ language binding to SDAI
- Project Leader: Tom Rando
- Part Editor: Debbie Pare

10303-24 Implementation methods: C language binding to SDAI
- Project Leader: David Price
- Part Editor: Peter Dupont

10303-25 Implementation methods: FORTRAN language binding to SDAI
- Project Leader: David Price
- Part Editor: Vacant

10303-32 Conformance testing methodology and framework: Requirements on testing laboratories and clients

Project Leader: Sheila Lewis
Part Editor: Sheila Lewis

10303-33 Conformance testing methodology and framework: Abstract test suites
Project Leader: Sheila Lewis
Part Editor: Sheila Lewis

10303-34 Conformance testing methodology and framework: Abstract test methods for part 21
Project Leader: Christophe Viel
Part Editor: Bob Matthews

10303-35 Conformance testing methodology and framework: Abstract test methods for part 22
Project Leader: Tom Phelps
Part Editor: Shantanu Dhar

10303-45 Integrated generic resources: Materials
Project Leader: Joe Carpenter
Part Editor: Robert Swindells

10303-47 Integrated generic resources: Tolerances
Project Leader: Phil Rosche
Part Editor: Bill Anderson

10303-49 Integrated generic resources: Process structure and properties
Project Leader: Greg Paul
Part Editor: Greg Paul

10303-103 Integrated application resources: Electrical/electronics connectivity
Project Leader: Vacant
Part Editor: Vacant

10303-104 Integrated application resources: Finite element analysis
Project Leader: Keith Hunten
Part Editor: Keith Hunten

10303-105 Integrated application resources: Kinematics
Project Leader: Arnold Ludwig
Part Editor: Hans-Peter Lorenz

10303-106 Integrated application resources: Building construction core model
Project Leader: Jeff Wix
Part Editor: Vacant

10303-202 Application protocol: Associative draughting
Project Leader: Kevin Freund
Part Editor: Diane Craig

10303-204 Application protocol: Mechanical design using boundary representation
Project Leader: Ray Goult
Part Editor: Ray Goult

10303-205 Application protocol: Mechanical design using surface representation
Project Leader: Jochen Haenisch
Part Editor: Per Evensen

10303-207 Application protocol: Sheet metal die planning and design
Project Leader: Mike Strub
Part Editor: Vacant

10303-208 Application protocol: Life cycle product change process
Project Leader: Rick Bsharah
Part Editor: Chuck Amaral

10303-209 Application protocol: Design-analysis of composite structures
Project Leader: Keith Hunten
Part Editor: Glen Ziolko

10303-210 Application protocol: Printed circuit assembly product design data
Project Leader: Tom Thurman
Part Editor: Kristi Adams

10303-211 Application protocol: Electronics test diagnostics and remanufacture
Project Leader: Steve Fortier
Part Editor: Vacant

10303-212 Application protocol: Electrotechnical Design and Installation
Project Leader: Reinhard Nerke
Part Editor: Alain Bezos

10303-213 Application protocol: Numerical control process plans for machined parts
Project Leader: Ashwini Sinha
Part Editor: Ashwini Sinha

10303-214 Application protocol: Core data for automotive design processes
Project Leader: Juergen Mohrmann
Part Editor: Hans-Joerg Speck

10303-215 Application protocol: Ship arrangements
Project Leader: Sam Mehta
Part Editor: Vacant

10303-216 Application protocol: Ship molded forms
Project Leader: Rob Howard
Part Editor: Vacant

10303-217 Application protocol: Ship piping
Project Leader: James Murphy
Part Editor: Douglas Martin

10303-218 Application protocol: Ship structures
Project Leader: Thomas Koch
Part Editor: Michael Polini

10303-220 Application protocol: Printed circuit assembly manufacturing planning
Project Leader: Paul Nelson
Part Editor: Sonja Baluch

10303-221 Application protocol: Process plant functional data and its schematic representation
Project Leader: David Leal
Part Editor: Vacant

10303-222 Application protocol: Design-manufacturing for composite structures
Project Leader: Floyd Ganus
Part Editor: Sonja Baluch

10303-223 Application protocol: Exchange of design and manufacturing product information for cast parts
Project Leader: Constantine Orogo
Editor: Michael Koopman

10303-224 Application protocol: Mechanical product definition for process planning using form features
Project Leader: Len Slovensky
Editor: Vacant

10303-225 Application protocol: Structural building elements using explicit shape representation
Project Leader: Wolfgang Haas
Editor: Vacant

10303-226 Application protocol: Ship's mechanical systems
Project Leader: John Kendall
Editor: Jerry Goodwin

10303-227 Application protocol: Plant spatial configuration
Project Leader: Jack Skeels
Editor: Vacant

10303-228 Application protocol: Building services: Heating, ventilation and air conditioning
Project Leader: Patrice Poyet
Editor: Vacant

10303-230 Application protocol: Building structural frame: Steelwork
Project Leader: Alistair Watson
Editor: Vacant

10303-1201 Abstract test suite: Explicit draughting
Project Leader: Julian Fowler
Editor: Vacant

10303-1202 Abstract test suite: Associative draughting
Project Leader: Allison Barnard Feeney
Editor: Allison Barnard Feeney

10303-1203 Abstract test suite: Configuration controlled design
Project Leader: Mitchell Gilbert
Editor: Vacant

10303-1204 Abstract test suite: Mechanical design using boundary representation
Project Leader: Ray Goult
Editor: Ray Goult

10303-1205 Abstract test suite: Mechanical design using surface representation
Project Leader: Jochen Haenisch
Editor: Vacant

10303-1207 Abstract test suite: Sheet metal die planning and design
Project Leader: Phil Rosche
Editor: Mike Strub

10303-1208 Abstract test suite: Life cycle product change process
Project Leader: Rick Bsharah
Editor: Chuck Amaral

10303-1209 Abstract test suite: Design-analysis of composite structures
Project Leader: Keith Hunten
Editor: Glen Ziolko

10303-1210 Abstract test suite: Printed circuit assembly product data manufacture
Project Leader: Tom Thurman
Editor: Vacant

10303-1211 Abstract test suite: Electronics, test diagnostics, and remanufacture
Project Leader: Steve Fortier
Editor: Vacant

10303-1212 Abstract test suite: Electrotechnical Plants
Project Leader: Reinhard Nerke
Editor: Alain Bezos

10303-1213 Abstract test suite: Numerical control process plans for machined parts
Project Leader: Ashwini Sinha
Editor: Ashwini Sinha

10303-1214 Abstract test suite: Core data for automotive design processes
Project Leader: Juergen Mohrmann
Editor: Jens Kuebler

10303-1215 Abstract test suite: Ship arrangements
Project Leader: Sam Mehta
Editor: Vacant

10303-1216 Abstract test suite: Ship molded forms
Project Leader: James Murphy
Editor: Vacant

10303-1217 Abstract test suite: Ship piping
Project Leader: James Murphy
Editor: Vacant

10303-1218 Abstract test suite: Ship structures
Project Leader: Thomas Koch
Editor: Vacant

10303-1220 Abstract test suite: Printed circuit boards and printed circuit assemblies
Project Leader: Paul Nelson
Editor: Sonja Baluch

10303-1221 Abstract test suite: Process plant functional data & its schematic representation
Project Leader: David Leal
Editor: Vacant

10303-1222 Abstract test suite: Design-manufacturing for composite structures
Project Leader: Floyd Ganus
Editor: Vacant

10303-1223 Abstract test suite: Exchange of design and manufacturing product information for cast parts
Project Leader: Constantine Orogo
Editor: Vacant

10303-1224 Abstract test suite: Mechanical product definition for process planning using form features
Project Leader: Len Slovensky
Editor: Vacant

10303-1225 Abstract test suite: Structural building elements
Project Leader: Wolfgang Haas
Editor: Vacant

10303-1226 Abstract test suite: Ship's mechanical systems
Project Leader: Jerry Goodwin
Editor: John Kendall

10303-1227 Abstract test suite: Plant spatial configuration
Project Leader: Jack Skeels
Editor: Vacant

10303-1228 Abstract test suite: Building services: Heating, ventilation and air conditioning
Project Leader: Patrice Poyet
Editor: Vacant

10303-1230 Abstract test suite: Building structural frame: Steelwork
Project Leader: Alistair Watson
Editor: Vacant

10vvv Manufacturing management data: External communications
Project Leader: Cliff Borchert
Editor: Cliff Borchert

10www Manufacturing management data: Resource usage
Project Leader: Bernard Katzy
Editor: Vacant

10xxx Manufacturing management data: Flow control
Project Leader: Wilhelm Dangelmaier
Editor: Vacant

13584-001 Parts library: General overview
Project Leader: Pat Harrow
Editor: Pat Harrow

13584-010 Parts library: Conceptual model
Project Leader: Guy Pierra
Editor: Guy Pierra

13584-020 Parts library: General resources
Project Leader: Rainer Bugow
Editor: Rainer Bugow

13584-024 Parts library: Library supplier format
Project Leader: Guy Pierra
Editor: Pat Harrow

13584-026 Parts library: Identification codes
Project Leader: Pat Harrow
Editor: Pat Harrow

13584-031 Parts library: Programming interface
Project Leader: Gerd Ehinger
Editor: Pat Harrow

13584-042 Parts library: Dictionary methodology
Project Leader: Guy Pierra
Editor: Vacant

13584-101 Parts library: Geometrical view exchange protocol by Parametric Program

Project Leader: Vacant
Editor: Vacant

13584-102 Parts library: Geometrical view exchange protocol by ISO 10303 conforming specification

Project Leader: Vacant
Editor: Vacant

Parametrics

Project Leader: R. Greening
Editor: Vacant

Procedures for the Development and Approval of International Standards

The procedures used within SC4 to develop and approve International Standards are based on the mandatory ISO Directives Part 1 but have been extended through formal resolutions of the subcommittee to set up a series of quality control checks that each document must meet before being sent out for official ballot. It is necessary to understand these procedures to see where each project is currently and know what must be done next.

The ISO Directives define six stages in the development life cycle of an International Standard:

Preliminary Stage

- Experts collaborate on technical subjects not sufficiently mature for proposing the scope of a new standards project.

Proposal Stage

- SC4 voting members ballot on the desirability of starting a new standards project.

Preparatory Stage

- A Project Leader manages the development of a Working Draft.

Committee Stage

- SC4 voting members achieve consensus on a Committee Draft (CD).

Approval Stage

- All ISO National Bodies vote on a Draft International Standard (DIS).

Publication Stage

- ISO publishes the International Standard (IS).

Preliminary Stage:

Proposals for new standards projects can originate from sources outside of the SC4 committee or can be planned by experts within the committee. The Preliminary stage can be used by SC4 to convene such a group of experts, but its use is optional. The activity is focused on characterizing the need for a new standards project, and the end result of the activity is the preparation of a proposal for a new work item.

Within SC4, activities in the Preliminary stage are called Planning Projects, and are generally concerned with discussions of which application protocols are required. SC4 has delegated to PMAG the authority to create new Planning Projects. Progress on each project is summarized at PMAG meetings and is tracked in the AP Status and Summary Report.

The Preliminary stage ends when the Planning Project has generated all New Work Item proposals in the specified area of technology.

Proposal Stage:

Every new standards project must be authorized by the voting members of the SC4 committee. This includes every project that will result in an ISO-published document whether it be a next edition of an existing standard, a technical report, or an amendment. A proposal for a new project may originate from a national body, the SC4 Secretariat, another ISO TC or SC, an organization in liaison, the ISO Technical Management Board or the ISO Chief Executive Officer.

In the Proposal stage, a proposal for a new standards project is circulated formally for ballot by SC4. P-member countries are asked two questions:

Do you agree that the project should be initiated by SC4?

Are you interested in actively participating in its development?

The Proposal stage ends when a new work item is approved by a simple majority of those voting and at least five countries agree to participate actively. When so approved, the project is assigned a standards number by the ISO Central Secretariat and a Project Leader by SC4.

Preparatory Stage:

The Preparatory stage covers the creation of a working draft of the ultimate standard. The work is performed by experts from participating countries under the direction of a Project Leader.

> *NOTE* - The ISO Directives do not give details for developing a working draft within a hierarchy of projects, WGs, and advisory groups. That is left to each SC to establish for itself. Therefore, SC4 developed procedures and methods documents to augment those established by ISO. Editorial guidelines are documented in the *Supplementary directives for the drafting and presentation of ISO 10303*. Technical guidelines are documented in the *Guidelines for the development of STEP integrated resources, STEP part qualification procedures,* the *Guidelines for development and approval of STEP application protocols, Guidelines for the development of abstract test suites, Guidelines for the development of application interpreted constructs*, and the *Guidelines for the development of mapping tables*.

In the development of many SC4 projects, the committee requires a review and comment of the working draft at an intermediate stage to ensure that the new project is heading in the right direction. This is being done with each of the P-LIB project documents and with each STEP AP. At this stage the draft is called a Committee Draft for Comment (CDC).

With the STEP APs, the review gives SC4 member countries an opportunity to study the application activity model (AAM) and the application reference model (ARM) to ensure that the scope of the project is accurate and that the AP requirements are complete. It is thought that this will help to build consensus on the requirements for the AP at the same time as the technical team is constructing the application interpreted model (AIM).

Before a CDC document is sent out for review by SC4, it must be released by the Project Leader and the Working Group Convener. For STEP APs it must also be reviewed by Qualification. Any comments from the Qualification review and a plan for addressing them should be added to the document as an informative annex.

The Preparatory stage of a project ends when a working draft of that part has been approved by each of the quality control checkpoints in the review process that was set up by the SC4 Project Management Advisory Group.

For STEP documents there are five checkpoint approvals:

Qualification Team,
Integration Team,
Project Leader,
Working Group Convener, and
Project Management Advisory Group.

NOTE - The Project Leader checkpoint is used to indicate that the project agrees with the Qualification and Integration teams that the document fulfills the intended scope and integrates well with the rest of STEP.

For P-LIB documents there are four checkpoint approvals:

Project Leader,
Editing Committee,
Working Group Convener, and
Project Management Advisory Group.

After a document has received approval at all checkpoints, it is sent to the SC4 Secretariat for preparation for the Committee Draft (CD) ballot.

Committee Stage:

The Committee stage begins with the circulation of the document in the form of a CD for formal balloting. A four-month voting period is used for the first CD ballot. Ballot comments are collected and summarized by the Secretariat.

A team consisting of the Secretariat, the SC4 Chairman, the affected Convener, and the Project Leader reviews the ballot comments to determine the degree of consensus obtained. Based on the evaluation, a decision is made to:

1. Discuss the CD and comments at the next meeting,
2. Register the CD as a Draft International Standard, or
3. Ask that a revised CD be prepared for circulation.

After each ballot, the project leader and editor prepare a revised document that reflects the consensus of the project team on each of the ballot comments received. The new CD document is then reviewed by:

Project Leader,
Qualification Team,
Integration Team,
Working Group Convener, and
Project Management Advisory Group.

If option (b) is chosen, the Committee stage ends, and the document is sent to ISO for registration as a Draft International Standard (DIS). But if the ballot decision above is (c), another CD ballot by SC4 is initiated. Succeeding CD ballot periods are a three month duration.

Approval Stage:

The Approval stage begins with circulation of the Draft International Standard (DIS) for formal balloting by all national bodies of ISO. A six-month voting period is prescribed. The DIS is approved if a two-thirds majority of votes cast by voting members of SC4 are in favor and if not more than 25 per cent of the total number of votes cast are negative. Abstentions are excluded when counting votes.

If so approved, the SC4 Chairman, in cooperation with the SC4 Secretariat, the Project Leader and PMAG, and in consultation with the ISO Chief Executive Officer makes a decision whether to:

1. Publish the document without change, except for editorial,
2. Amend the document in light of technical comments received, or
3. Refer the document back to committee for rework.

If option 2. is chosen, a new draft is prepared and is sent to ISO to be circulated for a two-month confirmation vote.

If the DIS is not approved, the SC4 Chairman, in cooperation with the Secretariat (and if necessary the Project Leader and the affected WG Conveners), and in consultation with the ISO Chief Executive Officer, makes a decision to rework the document or to recommend that it be published as a technical report.

As with the Committee stage above, a final copy of the document is prepared that reflects the results of the ballot comments, but for a DIS document, the preparation is done by the SC4 Secretariat. The resulting document is reviewed by each of the quality control checkpoints set up by the Project Management Advisory Group. These include the Project Leader, the Working Group Convener, the Editing Committee, and the Qualification Project, and Integration Projects.

The Approval stage ends when these authorizations are accomplished and the Secretariat sends the final manuscript to ISO for publication as an International Standard.

Publication Stage:

Publication is handled by the ISO Central Secretariat. The document is reviewed by the ISO Editorial Board for conformance to ISO style guidelines and returned to the SC4 Secretariat if any changes are needed. When all required changes have been made, the Secretariat sends camera-ready copy to ISO who prepares the cover, prints the document, and sends a copy to each National Body for distribution.

Procedures for the Approval of SC4 Companion Documents

In addition to producing International Standards, SC4 also produces documents (such as those listed in the note on page 25) that describe the methodology followed by SC4 or provide technical information in addition to that published in an International Standard. These documents may be issued as PMAG documents or as ISO technical reports.

A PMAG document must receive the following approvals before final publication:

Document owner,
Working Group conveners, and
PMAG.

An ISO technical report must receive the following approvals before final publication:

Document owner,
Working Group conveners,
PMAG, and
SC4

SC4's Use of Electronic Mail

The work of SC4 is carried out by experts in many countries who maintain good communications through the use of electronic mail (E-mail). Message and document distribution is automated for a number of special interest areas by E-mail mailing list exploders.

Shown below is a listing of all SC4 E-mail mailing lists. Each list has two addresses associated with it--a list address and a maintenance address. Messages sent to the list address will be reflected out to all names on the associated list. To report problems or to request the addition, correction, or deletion of an address from the associated list, a message is sent to the list maintenance address. Note that some lists are maintained by automated software.

For further information, contact:

Bradford Smith
Chairman, ISO TC 184/SC4
smithb@cme.nist.gov
+1 301 975-3558

SC4 E-mail Mailing Lists

Mailing List	Addresses for List and Maintainer
All people interested in the work of SC4 committee	List Address: sc4@cme.nist.gov Maintenance: majordomo@cme.nist.gov
SC4 Conveners WG & AG Conveners	List Address: convener@cme.nist.gov Maintenance: randall@cme.nist.gov
SC4 Project Management Advisory Group	List Address: pmag@cme.nist.gov Maintenance: welling@cme.nist.gov
SC4 Project Leaders List of all PL's	List Address: projlead@cme.nist.gov Maintenance: randall@cme.nist.gov
SC4 Document Editors List of all Editors	List Address: editors@cme.nist.gov Maintenance: randall@cme.nist.gov
SEDS Report Input List	List Address: seds@cme.nist.gov Maintenance: randall@cme.nist.gov
SEDS Reviewer List	List Address: seds-rev@cme.nist.gov Maintenance: smithb@cme.nist.gov
Working Group 2 Part Libraries	List Address: wg2-list@imw.tu-clausthal.de Maintenance: bugow@imw.tu-clausthal.de
Working Group 3 Product Modeling	List Address: wg3@cme.nist.gov Maintenance: randall@cme.nist.gov
Working Group 3 Team and Project Leaders	List Address: wg3-lead@cme.nist.gov Maintenance: majordomo@cme.nist.gov
Working Group 4 Qualification & Integration	List Address: wg4@cme.nist.gov Maintenance: mitchell@cme.nist.gov
Working Group 5 STEP Development Methods	List Address: wg5@cme.nist.gov Maintenance: randall@cme.nist.gov
Working Group 6 Conformance Testing	List Address: wg6@cme.nist.gov Maintenance: mitchell@cme.nist.gov
Working Group 7	List Address: wg7@cme.nist.gov

Implementation Specs	Maintenance: wg7-request@cme.nist.gov
Working Group 8 Manufacturing Management	List Address: wg8@cme.nist.gov Maintenance: ray@cme.nist.gov
Joint Working Group 9 Electrical/Electronics	List Address: jwg9-all@eeel.nist.gov Maintenance: jwg9-request@eeel.nist.gov
Abstract Test Suite Project	List Address: ap-ats@cme.nist.gov Maintenance: randall@cme.nist.gov
EXPRESS Users Group	List Address: express-users@cme.nist.gov Maintenance: majordomo@cme.nist.gov
EXPRESS Version 2 Project	List Address: express-v2@cme.nist.gov Maintenance: majordomo@cme.nist.gov
EXPRESS and SGML Interoperability	List Address: express.sgml@cme.nist.gov Maintenance: majordomo@cme.nist.gov
Usage of SGML and HTML SDAI Data Access Interface Project	List Address: sgml.step.docs@cme.nist.gov majordomo@cme.nist.gov List Address: sdai@cme.nist.gov Maintenance: sdai-request@cme.nist.gov
STEP Implementors Group	List Address: step-imp@cme.nist.gov Maintenance: randall@cme.nist.gov
Qualification Team	List Address: qualcore@cme.nist.gov Maintenance: randall@cme.nist.gov
Automotive AP Project	List Address: ap214@cme.nist.gov Maintenance: randall@cme.nist.gov
Parametrics Project	List Address: parametrics@cme.nist.gov Maintenance: majordomo@cme.nist.gov
AEC Project General Discussion	List Address: step-aec@nist.gov Maintenance : cic-majordomo@nist.gov
AEC Building construction Subgroup	List Address: step-building@nist.gov Maintenance : cic-majordomo@nist.gov

AEC Offshore Subgroup	List Address: step-offshore@nist.gov Maintenance : cic-majordomo@nist.gov
AEC Process Plant Subgroup	List Address: step-proplant@nist.gov Maintenance : cic-majordomo@nist.gov
AEC Shipbuilding Subgroup	List Address: step-ship@nist.gov Maintenance : cic-majordomo@nist.gov

NOTE - When the maintenance address given above is "majordomo" or "cic-majordomo," list maintenance is accomplished by an automated server that responds to commands included in the body of messages sent to that address. Example commands include:

subscribe <list> [<address>]	Subscribe yourself (or another <address> if specified) to the named <list>.
unsubscribe <list> [<address>]	Unsubscribe yourself (or another <address> if specified) from the named <list>.
which [<address>]	Find out which lists you (or <address> if specified) are on.
who <list>	Find out who is on the named <list>.
info <list>	Retrieve the general introductory information for the named <list>.
lists	Show the lists served by this Majordomo server.
help	Retrieve this message.
end	Terminate list of commands to be interpreted by Majordomo.

Commands should be sent in the body of an E-mail message to "majordomo@cme.nist.gov" or to "cic-majordomo@nist.gov." Commands in the "Subject:" line are ignored.

Availability of SC4 Publications

SC4 committee documents are available in paper and electronic form. Paper copies of the documents are maintained by national bodies participating in the work of SC4. A contact for each national body follows.

Country	*Contact*	*Phone*	*FAX*
France	Sylvie Arbouy	+33-42-91-5601	+33-42-91-5656
Hungary	Dorottya Bardos	+36 26 74 013	+36 26 74 330
Netherlands	Peter Bessems	+31 15 69 01 92	+31 15 69 0190
Australia	Brigitte Catteau	+61 2 746 4700	+61 2 746 8450
Romania	Mihail Ciocodeica	+400 611 40 43	+400 312 08 23
Brazil	Accacio dos Santos	+55 21 210 31 22	+55 21 240 82 49
Switzerland	Carl-Arthur Eder	+41 12 54 54 13	+41 12 54 54 74
Germany	Meinolf Gropper	+49 69 6603 650	+49 69 6603 511
Norway	Bjornhild Saeteroy	+47 22 46 58 20	+47 22 46 18 38
Italy	G. Jannuzzi	+39 11 50 10 27	+39 11 50 18 37
Japan	Chie Kouchi	+81 33 233 3475	+81 33 233 3450
Sweden	Lennart Persson	+46 87 83 82 90	+46 86 67 85 42
Canada	George Zaleski	+ 1 613 238 3222	+ 1 613 995 4564
United Kingdom	Paul Leadbeater	+44 71 629 9000	+44 71 6032084
United States	Nancy Flower	+ 1 703 698 9606	+ 1 703 560 2752

Electronic copies of SC4 documents as well as experimental software are available on several archives accessible by modem, E-mail, ftp, gopher and World Wide Web. Each archive is described more fully in a separate annex of this reference manual. A chart showing the general content and access method(s) follows.

		Telephone	<--------*Internet*---------->			
Archive	*Content*	*Modem*	*E-mail*	*FTP*	*Gopher*	*WWW*
SC4	SC4 Committee Archive	.	.	.	.	Y
SOLIS	STEP Project Documents	Y	Y	Y	Y	.
P-LIB	P-LIB Project Documents	.	Y	Y	.	Y
NPDERC	Worldwide PDE Project Information	.	.	.	.	Y
STEP-JP	Chiba University STEP	.	.	.	.	Y
STEP-AU	James Cook University	.	.	.	.	Y
E-mail	SC4 E-mail Archives	.	Y	.	.	.

STEP-Related Information

Books --

STEP - An Introduction: Dr. Jon Owen

Ordering information: ISBN 1-874 728-04-06
Information Geometers Ltd.
47 Stockers Avenue, Winchester S022 5LB UK

This book is a companion to part 1 of ISO 10303 (Overview and fundamental principles). The book places STEP in the context of other product data exchange specifications and standards, describes the structure of the standard, and gives the history that resulted in that structure. The author also explains how STEP is likely to be used.

Information Modeling: The EXPRESS Way: Douglas Schenck & Dr. Peter Wilson

Ordering Information: ISBN 0-19-508 714-3
Oxford University Press
200 Madison Avenue
New York, New York 10016 USA

The authors examine the history, practicalities, and implications of information modeling in general, and consider the differences in normal language that necessitate precise communication methods.

Integriertes Produktmodell: Hans Grabowski, Reiner Anderl, Adam Polly
(Integrated Product Model) Beuth Verlag, Berlin, 1993

The authors present an overview of:

1. Methods that are used for the specification of the integrated product model of ISO 10303 and its application protocols (EXPRESS, EXPRESS-G, NIAM, IDEF1x);
2. Methodology, architecture and development methods of ISO 10303;
3. Content of the integrated product model of ISO 10303;
4. Application protocols of ISO 10303; and
5. An overview of the architecture and content of ISO 13584.

CAD-Schnittstellen: Reiner Anderl
(CAD-Interfaces) Carl Hanser Verlag, Muenchen 1993

This book gives a comprehensive overview of CAD-interface technologies. It covers methodology and methods of interface specification development and has a special focus on STEP technology.

STEP Concepts foundamentaux: S. Arbouy, A. Bezos, A.-F. Cutting-Decelle, P. Diakonoff, P. Germain-Lacour, J.-P. Letouzey et C. Viel, AFNOR, 1994

This book describes the need for STEP and gives information about the STEP Project, its architecture, and the series of parts that comprise ISO 10303.

Ordering information: ISBN: 2-12-486912-4
LOUIS-JEAN
avenue d'Embrun, 05003 GAP cedex, France

Tel. 92.53.17.00
Depot legal: 558 - Juillet 1994

Product Model Representation and its Use - STEP: Fumihiko Kimura, Toshio Kojima, Yutaka Kugal, Ichiro Nakamura, and Hideaki Yokota, Japan Standards Association, April 1995.

This book describes STEP and the product model, representation of the product model and representation tools, mapping between product models, and STEP data exchange systems.

Ordering information: ISBN:4-542-30380-2; Toshio Kojima, 1995

Newsletters --

STEP Tools News: This newsletter, published quarterly by STEP Tools Inc., describes applications of the company's EXPRESS-based toolkit and contains general articles on product data exchange. For more information, contact STEP Tools, Inc. by phone: +1 518-276-2848; by fax: +1 518-272-6744; or by E-mail: info@steptools.com.

Product Data International: This newsletter, published bimonthly by Warthen Communications, reports on IGES, PDES, STEP and related activities for computer integrated manufacturing and construction. For more information, contact Warthen Communications by phone or fax: +1 608 862-1702 or by E-mail: warthen@tmm.me.wisc.edu.

FCIM Focus: This bulletin, published quarterly, in aimed at the general CIM community but has some articles on STEP and other CALS-related standards. For more information, contact Shirley Goodman by phone: +1 502-364-6428; by fax: +1 502-364-6261; or by E-mail to goodman@SCRA.org.

EXPRESS-Related Items --

A compendium of EXPRESS compilers and other tools known to the EXPRESS Users Group has been produced by Peter Wilson and is available electronically from the STEP On-Line Information Service (SOLIS) in subdirectory step/sc4docs/express. (See Appendix D for more information on SOLIS).

The EXPRESS Users Group has two E-mail exploders for electronic discussions about EXPRESS. express-users@cme.nist.gov is for discussions related to the user of EXPRESS version 1.0; express-v2@cme.nist.gov is for discussions related to the language design for EXPRESS version 2.0. Refer to the section on SC4's use of electronic mail for more information.

NIST has constructed an automated system known as the NIST EXPRESS Server for various operations on EXPRESS schemas. The system, provided to the EXPRESS community at no cost, may be accessed via E-mail, telnet, or login.

Current services provided are:
- Analysis of EXPRESS schemas,
- Analysis of part 21 exchange files against schemas,
- Graphical browsing and editing of schemas and instances,
- Conversion of short form to annotated listing.

References to standard or draft-standard schemas are automatically fulfilled by an on-line library of such schemas.

Some services require the construction of new programs. At user request, these programs can be returned by E-mail or run remotely at NIST while displayed locally on an X window server. For more information, send E-mail to express-server@cme.nist.gov. Put "help" in the message body.

NIST STEP Toolset --

The NIST STEP Toolset consists of many inter-related yet independent pieces. It contains four toolkits and numerous tools, some of which are included in the toolkits:

NIST EXPRESS Toolkit	NIST EXPRESS Server
NIST EXPRESS Pretty Printing Toolkit	Data Probe
NIST Part 21 Exchange File Toolkit	Shtolo
NIST STEP Class Library	Transformr

The Toolset is accessed from SOLIS in the directory pub/step/npttools; access the readme.txt file first.

Annex A
Scopes of the Parts of the Initial Release of ISO 10303

This annex contains the complete scope statement from ISO 10303-1 and excerpts from the scope statements of the remaining parts of the Initial Release. Scope statements for additional parts of ISO 10303 and the parts of ISO 13584 are found in the appropriate part directory on SOLIS.

ISO 10303 Industrial automation systems and integration –
Product data representation and exchange –

Part 1: Overview and fundamental principles

This part of ISO 10303 provides an overview of this International Standard.

This International Standard provided a representation of product information along with the necessary mechanisms and definitions to enable product data to be exchanged. The exchange is among different computer systems and environments associated with the complete product life cycle, including product design, manufacture, use, maintenance, and final disposal of the product.

The following are within the scope of ISO 10303:

- the representation of product information, including components and assemblies;

- the exchange of product data, including storing, transferring, accessing, and archiving.

This part of ISO 10303 defines the basic principles of product information representation and exchange used in ISO 10303. It specifies the characteristics of the various series of parts of ISO 10303 and the relationships among them.

The following are within the scope of this part of ISO 10303:

- an overview of this International Standard;

- the structure of this International Standard;

- definitions of terms used throughout this International Standard;

- an overview of data specification methods used in this International Standard including the EXPRESS data specification language and graphical presentation of product information models;

- an introduction to the integrated resources;

- an introduction to application protocols that are used to define the scope, context and information requirements of an application, and the representation of the application information;

- an introduction to the methodology and framework for conformance testing to provides an assessment of whether an implementation conforms to this International Standard;

- an introduction to the abstract test suites to be used as a basis for conformance testing;

- an introduction to the implementation methods which may be used with this International Standard.

Part 11: Description methods: The EXPRESS language reference manual

This part of ISO 10303 defines a language by which aspects of product data can be specified. The language is called *EXPRESS*.

This part of ISO 10303 also defines a graphical representation for a subset of the constructs in the *EXPRESS* language. This graphical representation is called *EXPRESS-G*.

EXPRESS is a data specification language as defined in ISO 10303-1. It consists of language elements which allow an unambiguous data definition and specification of constraints on the data defined. . . . *EXPRESS* is not a programming language.

Part 21: Implementation methods: Clear text encoding of the exchange structure

This part of ISO 10303 specifies an exchange structure format using a clear text encoding for product data for which the conceptual model is specified in the EXPRESS language (ISO 10303-11). The file format is suitable for the transfer of product data among computer systems.

The mapping from the EXPRESS language to the syntax of the exchange structure is specified. Any EXPRESS schema can be mapped onto the exchange structure syntax.

Part 31: Conformance testing methodology and framework: General concepts

This part of ISO 10303, which introduces the series of parts devoted to conformance testing, specifies a general methodology and framework for testing the conformance of an implementation of ISO 10303. During conformance testing, such an implementation is termed an IUT (implementation under test).

Part 41: Integrated generic resources: Fundamentals of product description and support

This part of ISO 10303 specifies the following:

- generic product description resources;
- generic management resources;
- support resources.

Part 42: Integrated generic resources: Geometric and topological representation

This part of ISO 10303 specifies the resource constructs for the explicit geometric and topological representation of the shape of a product. The scope is determined by the requirements for the explicit representation of an ideal product model; tolerances and implicit forms of representation in terms of features are out of scope. The geometry in clause 4 and the topology in clause 5 are available for use independently and are also extensively used by the various forms of geometric shape model in clause 6. In addition, this part of ISO 10303 specifies specialisations of the concepts of representation where the elements of representation are geometric.

Part 43: Integrated generic resources: Representation structures

This part of ISO 10303 specifies the integrated generic resources for associating elements of representation into distinct collections. It provides a basis for distinguishing, within a set of such elements, which elements are related and which elements are not. This part also includes structure for specifying the relationships among these collections, including transformation of one representation as it participates in such a relationship.

Part 44: Integrated generic resources: Product structure configuration

This part of ISO 10303 specifies the resources to manage the structure and configuration of a product during its life cycle.

The following are within the scope of this part of ISO 10303:

- the relationship among the components and assemblies of a product;
- the relationship among products and their components as made by modification of other products;

Part 46: Integrated generic resources: Visual presentation

This part of ISO 10303 specifies the integrated resources for the visualization of displayable product information. Presentation data as provided in this part are combined with product data and are exchanged together between systems with the aim that the receiving system can construct one or several pictures of the product information suitable for human perception.

This part specifies the generic resources required to describe the desired visual appearance of product information in its picture. The actual generation of the picture from the product information and its presentation data is left to the receiving system. The actual depiction may deviate from this target because of limitations in the capabilities of graphics systems.

Product model properties can be visualized in two ways, either by realistic, life-like images according to the rules of projective geometry and light propagation and reflection, or by symbolic presentations that conform with draughting standards and conventions. This part supports both types of presentations. The two types of visualization processes require different kinds of graphical transformations and these may be combined in the same picture.

Part 101: Integrated application resources: Draughting

This part of ISO 10303 specifies the resource constructs for the representation of draughting information. The following are within the scope of this part of ISO 10303:

- information regarding the definition, description, and administration of a drawing and the sheets of a drawing;

- elementary draughting annotations and their aggregation with more general annotations for the depiction of facts and requirements concerning the product or interpretation of a drawing;

- draughting annotations used in the depiction of dimensions, tolerances, and related dimension-measurement information.

Part 201: Application protocol: Explicit draughting

This part of ISO 10303 specifies the integrated resources necessary for the scope and information requirements for explicit draughting.

This part of ISO 10303 is applicable to the inter-organization exchange of computer-interpretable drawing information and product definition data.

The following are within the scope of this part of ISO 10303:

- the representation of drawings for the purpose of exchange, especially for mechanical engineering and architecture, engineering, and construction applications;

- the representation of the real size of a product depicted in a drawing to enable use by applications where true geometric equivalence is required.

Part 203: Application protocol: Configuration controlled 3D designs of mechanical parts and assemblies

This part of ISO 10303 specifies the integrated resources necessary for the scope and information requirements for the exchange between application systems of configuration-controlled 3D designs of mechanical parts and assemblies. Configuration in this context only includes data and processes that control the 3D product design data. Exchange is used as a scoping consideration to narrow the scope to only those data which are exchanged as part of the 3D product definition. Organizations exchanging data within the scope of this part of ISO 10303 may have a contractual relationship, the details of which are outside the scope of this part.

Annex B
The Standard Enhancement and Discrepancy System (SEDS)

The Standard Enhancement and Discrepancy System (SEDS) is an information and process tool to service users of the ISs produced by ISO TC 184/SC4. Given the complexity of developing a product data exchange standard, the IS may have discrepancies that are discovered or enhancements that are needed by those who build implementations of the existing IS. SEDS was created to equitably process such discrepancies or enhancements for all SC4 standards and is currently being applied to parts of ISO 10303.

Any user who detects a fault that requires immediate attention may generate a SEDS Report. A user may also use the SEDS process to suggest a future enhancement to an IS. A separate Report shall be filed for each discrepancy or suggested enhancement. A copy of a SEDS Report form is found below, and complete SEDS processing instructions can be found on SOLIS under the SC4 documents directory (N308 files).

To initiate a SEDS Report, the user completes the Enhancement and Discrepancy Information Section (Section 2) of the SEDS Report and sends it, via his/her National Body, to the ISO TC 184/SC4 Secretariat. The Report may be sent by electronic mail (E-mail) or by regular mail accompanied by an ASCII electronic version of the Report.

By E-mail, send Report to: seds@cme.nist.gov

By postal mail, send Report to:
(include an electronic version)
STEP SEDS Coordinator
NIST
Bldg. 220, Rm. A-127
Gaithersburg, MD 20899, USA

Each report will be assigned an appropriate level of resources to be responsible for analyzing and generating a response to the Report. The SC4 Secretariat will take proper action to ensure that all changes become part of the next edition of the standard.

A list of all SEDS Reports is available on SOLIS.

SEDS Report Form:

Section 1. GENERAL INFORMATION (completed by the SEDS Coordinator):

SEDS Report Issue Number:
Date Submitted:
Status and date:
SEDS Team Leader:
SEDS Team Members:

Section 2. ENHANCEMENT and DISCREPANCY INFORMATION (completed by author of a SEDS Report):

Author:
Submitted by:
Part/Clause Affected by the Issue:
Other Parts Affected by the Issue:
Problem Description:
Conditions Under Which the Issue Was Discovered:
Proposed Solution: (Optional)
Additional Notes:

Section 3. RESPONSE INFORMATION (completed by SEDS Team Leader):

Accepted/Rejected: (date)
If Accepted, Resolution
If Rejected, Reason:
Comments:

Section 4. FOLLOW-UP INFORMATION (completed by SEDS Coordinator):

Magnitude of Change:
No further Action Required:
Action Required by SEDS Coordinator:
Action Required by WG Conveners:
Action Required by P-members:
Action Required by Editing Committee:
Action Required by TC 184/SC4:
Result of Required Action:

Annex C -- Officers and Conveners of ISO TC 184/SC4

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Deputy Convener	Vacant			
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Annex D
The STEP On-line Information Service (SOLIS)

The National Institute of Standards and Technology (NIST) in Gaithersburg, Maryland, USA maintains a public archive of software, documentation, and supporting material for the STEP Project. SOLIS also contains general information about TC 184/SC4 including management summaries, historical records, project schedules and future plans. Software such as the STEP Toolkit is available also.

There are four methods of accessing SOLIS information:

kermit server
electronic mail
anonymous ftp
internet gopher

Instructions for using these methods follow.

kermit server:

Dial-up connection with SOLIS using commercial phone lines is available with the NIST modem pool at +1 301 948 9720.

Use a communications package that supports the kermit protocol
When prompted "Enter Username>", type in your last name
Connect to the SOLIS by typing in: connect solis.cme
At the "Login:" prompt, type in: kermit
Answer the prompts to register yourself as a user

You will be logged in to the kermit server and will be able to access all the files available on SOLIS.

electronic mail:

Electronic mail connection with SOLIS is available via a mail-server at solis@cme.nist.gov. The mail-server processes commands in the body of the message (text in the subject line is ignored). Typical mail-server commands include:

Type "help" to get the help file (instructions for use of the archive server)
Type "index all" to get a list of directories, subdirectories, and file names
Type "index <dname>" to receive all the files in the <dname> directory
Type "send step/<dname>" to receive all the files in a directory

Type "send step/<dname>/current" to receive all files of the most the current version of that part
Type "send step/<dname>/<subdname>/<filename>" to receive a particular file
Type "send step/howto/mailhelp.txt" for an explanation of the archive server

anonymous ftp:

Anonymous file transfer protocol access to SOLIS directories is available to users on Internet:

ftp site: ftp.cme.nist.gov (or, ftp 129.6.32.54)
name: anonymous
password: <your-user-ID> (for example, rinaudot@cme.nist.gov)
cd to: pub/step (this is where the files to be downloaded are located)

internet gopher:

A gopher-server is available at elib.cme.nist.gov on port 70. There are two ways to access the SOLIS gopher-server, as a gopher client or through the World Wide Web:

1. Gopher client, connect to the following host:

   elib.cme.nist.gov

   For example, if your executable file is "gopher", type:

   gopher elib.cme.nist.gov

   You are now in SOLIS, using the gopher menu. Just select either the "step" directory or the "howto" directory and proceed! When you have found a file you would like to receive, there are two ways to download that file.

   a. E-mail the file. For this method, you must be viewing the file that you want to receive. Type "m" and a "Mail current document to:" window will appear. Enter your E-mail address, press the "Enter" key, and the file will be E-mailed to you.

   b. Save the file to your local machine. For this method, you must either be viewing the file or have the file selected in the gopher menu. Type "s" and a "Save in file:" window will appear. You can enter the name you want for the file or use the default provided by the gopher client, and then press the "Enter" key.

2. World Wide Web (WWW) browser (such as Mosaic):
   Use one of the following URLs:
   gopher://elib.cme.nist.gov or
   http://elib.cme.nist.gov:70/

You are now in SOLIS, using the gopher menu. Just click on either the "step" directory or the "howto" directory and proceed! When you have found a file you would like to receive, there are two ways to download that file.

a. When you are viewing the file you want, open the "File" pull down menu and select the "Mail To" option and fill in your E-mail address. The file will then be E-mailed to you.

b. You must first be at the gopher menu that lists the file that you want. Next, you pull down the "Options" menu and click on "Load to Local Disk". Select the file you want (ASCII, WordPerfect, or PostScript) from the Gopher menu. The "Save Binary File to Local Disk" window will appear. Then, select the directory where you want to save the file and fill in the "Name for binary file on local disk:".

Note: These instructions are specific to Mosaic for X Windows. The procedures for Mosaic for Microsoft Windows and Mosaic for Macintosh will differ slightly.

For general information, to make suggestions for improvements or to report problems, contact:

Gaylen Rinaudot
SOLIS Administrator
NIST A127 Bldg 220
Gaithersburg, MD 20899 USA

Phone: +1 301 975 3386
Fax: +1 301 258 9749
E-mail: solis-admin@cme.nist.gov

Annex E
The P-LIB Archive at University of Clausthal

The University of Clausthal in Germany maintains a public archive of documentation and supporting material for the Parts Library (P-LIB) Project and provides a mirror of the NIST SOLIS archive.

There are three methods of accessing P-LIB information:

electronic mail
anonymous ftp
World Wide Web

Instructions for using these methods follow.

electronic mail:

Electronic mail access to the Clausthal P-LIB archive is available via a mail-server at plib@imw.tu-clausthal.de. The mail-server processes commands in the body of the message (text in the subject line is ignored). For more detailed information on its use, send the command "help."

anonymous ftp:

Anonymous file transfer protocol access to the Clausthal P-LIB directories is available to users on Internet.

ftp site: ftp.imw.tu-clausthal.de
name: anonymous
password: <your-user-ID> (for example, expert@xyz.com)
cd to: /pub/step/wg2

For convenience of use in Europe, Clausthal makes available a mirror of the NIST SOLIS archive under the directory:

ftp site: ftp.imw.tu-clausthal.de
cd to: /mirror/nist

World Wide Web:

The P-LIB directories are available at the URL address:

http://www.imw.tu-clausthal.de/imw/projects/step/stand.html

The Mosaic page gives you access to various information sources like:

- html-versions of ISO 13584 drafts

- ftp-server (ftp://ftp.imw.tu-clausthal.de/pub/step)
  - ISO 13584/ENV 40004 drafts
  - Parametrics drafts
  - EXPRESS-tools collection

- mailing-list archive for wg2-list and parametrics

In addition the server provides a collection of useful web-tools (viewer, server, converter, ...) for unix and Mac.

For general information, to make suggestions for improvements or to report problems, please contact:

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Phone: + 49 5323 72 2696
Fax : + 49 5323 72 3501
E-mail: bugow@imw.tu-clausthal.de
ort@imw.tu-clausthal.de

Annex F
The National Product Data Exchange Research Center Library

The National Product Data Exchange Resource Center (NPDERC) maintains a public archive of documentation on almost all research and implementation projects having to do with digital product data.

The archive is only available to those who have access to the World Wide Web on the Internet. NPDERC has developed an Electronic Library that has a reasonably comprehensive list of introductory information, description of STEP projects and Application Protocols, contact information and pointers to other international servers with STEP information.

The NPDERC library is available at the URL address:

http://www.eeel.nist.gov/nipde/Intro.html

If you feel the information is not accurate, needs to be updated or if you would like to add projects, send the information to:

Jeff Zink
US PRO
2722 Merrilee Drive, Suite 200
Fairfax, VA 22031

Phone: +1 703-698-9606
Fax: +1 703-560-2752
E-mail: jzink@uspro.fairfax.va.us

Annex G
The STEP Archive at Chiba University

Chiba University in Japan maintains a public archive of documentation and supporting material for the STEP Project and provides a World Wide Web access to the NIST SOLIS archive and the Australian STEP archive.

The archive contains several collections of documentation, activities and related software, including DTD viewer (such as DTD to HTML converters).

The Chiba archive is only available to those who have access to the World Wide Web on the Internet. The URL address is:

http://www.hike.te.chiba-u.ac.jp/ikeda/documentation/home.html

Select topics depending your interest.

For general information, to make suggestions for improvements or to report problems, please contact:

Hirokai Ikeda
Chiba University

E-mail: ikeda@hike.te.chiba-u.ac.jp

Annex H
The STEP Archive at James Cook University

The Division of Construction Management at James Cook University in North Queensland, Australia is building a public archive of documentation and supporting material for the STEP Project.

The archive is available by anonymous file transfer protocol to users on Internet:

ftp site: ftp.jcu.edu.au
name: anonymous
password: <your-user-ID> (for example, expert@xyz.com)
cd to: pub/STEP

For general information, to make suggestions for improvements, or to report problems, please contact:

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Annex I
ISO TC 184/SC4-Related Acronyms & Abbreviations

Acronym	Complete Name
AAM	Application Activity Model
AIC	Application Interpreted Construct
AIM	Application Interpreted Model
ANSI	American National Standards Institute
AP	Application Protocol
APPP	Application Protocol Planning Project
ARM	Application Reference Model
ATS	Abstract Test Suite
CD	Committee Draft
CDC	Committee Draft for Comment
CM	Configuration Management
DIS	Draft International Standard
ESPRIT	European Strategic Program for Research in Information Technology
IUT	Implementation Under Test
IS	International Standard
ISO	International Organization for Standardization
JWG	Joint Working Group
JTC	Joint Technical Committee
MANDATE	Manufacturing Management Data
PICS	Protocol Implementation Conformance Statement
P-LIB	Parts Library
PMAG	Project Management Advisory Group
PPC	Policy and Planning Committee
Q,I, & E	Qualification, Integration, and Editing
SC	Subcommittee
SDAI	Standard Data Access Interface
SEDS	Standard Enhancement and Discrepancy System
SOLIS	STEP On-Line Information Service
STEP	Standard for the Exchange of Product Model Data
TAG	Technical Advisory Group
TC	Technical Committee
UoF	Units of Functionality
WD	Working Draft
WG	Working Group

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